TRANSMISSION: IS EQUITY STYLE INDEX BETTER THAN STOCK MARKET INDEX?

Wee-Yeap Lau, Chin Lee

Introduction

Equity style index has been widely used in the field of investment management since the introduction of return-based style analysis by Nobel Laureate William Sharpe in 1992 [30]. The style index is used as one of the independent variables in decomposing the fund returns to their respective allocation in different asset classes. Many researchers have followed suit in their respective research like Fama and French ([14], [15], [16]) and Lakonishok et al. [25]. In addition, International equity styles have also been studied by Sharpe et al. [5] and Sinquefield [32].

The popularity of equity style indices is further propelled with the introduction of Style Box by Morningstar in late nineties. In the money management industry, many equity style indices have been created as benchmark for performance attribution, evaluation and measurement by Index providers like MSCI, S&P and FTSE. Various types of funds are also been classified using the equity style indices created by different Asset Management Companies (AMC).

The study on the role of equity style index is important in the context of emerging capital market. Without a proper recognition of its role, from investment product point of view, investors lose out an opportunity to have additional investment products which focus on different segments of the stock exchange. Likewise, fund managers would lack of the chance to benchmark their performance if they intend to focus specifically on the growth / small and value / large segments of the stock exchange.

Interestingly, there is yet to be a study that links equity style index and stock index, or equity style index and business cycle indicators. If equity style index is indeed that useful, it should possess economic content that is justifiable for its usage in capital market. In this paper, firstly, we intend to study the causal relationship among equity style index, leading economic index and stock market index. Secondly, we intend to compare the efficacy of information transmission between stock market index and equity style index.

As known by many practitioners, leading, coincident and lagging economic indices are published by Department of Statistics on monthly basis to gauge the business sentiment. They are composite indices as within each index, there are components that underpin the measurement. For example, for leading economic index (LEI), there are eight leading indicators used. Leading indicators inform users on where the economy is heading, particularly for the forecasted period of six-month ahead. Among the earlier signs that an ongoing expansion may start to decelerate is a sustained decline in the leading growth rate.

On the other hand, coincident indicators inform users on the current state of the economy. In contrast, lagging indicators inform users what had happened to the economy, especially on performance of cyclical movements of the leading and coincident indicators. In this respect, we examine the components of all the three indices as shown in table 1.

As shown in table 1, coincident, leading and lagging indices have six, eight and five components respectively. These economic indicators are jointly developed by the Department of Statistics, Malaysia and Center for International Business Cycle Research (CIBCR) at Columbia University. Among the components in Leading Economic Index, Bursa Malaysia Industrial Index – a stock market index is included.

From economic perspective, the effective of leading economic index becomes questionable if its component is insensitive to the change of business cycle. This would enable inaccurate

DOI: 10.15240/tul/001/2015-3-001

Tab. 1: Components of leading, coincident and lagging economic indices

Coincident Economic Index Components (CEI)
1. Index of Industrial Production
2. Real Gross Imports
3. Real Salaries and Wages, Manufacturing
4. Total Employment, Manufacturing
5. Real Sales, Manufacturing
6. Real Contributions, EPF
Leading Economic Index Components (LEI)
1. Real Money Supply, M1
2. Bursa Malaysia Industrial Index
3. Real Total Trade: Eight Major Trading Partners
4. CPI for Services, Growth Rate (Inverted)
5. Industrial Material Price Index, Growth Rate
6. Ratio of Price to Unit Labour, Cost of Manufacturing
7. Number of Housing Permit Approved
8. Number of New Companies Registered
Lagging Economic Index Components (LGEI)
1. 7-day Call Money, Rate
2. Real Excess Lending to Private Sector
3. Number of Investment Projects Approved
4. Number of Defaulters, EPF (Inverted)
5. Number of New Vehicles Registered

Source: Department of Statistics, Malaysia [10]

signal on the part of data collection and dissemination by Department of Statistics and Central Bank. The weaknesses of the existing indicators have been discussed by some researchers. According to Ahmad [1], there exists some limitation to the existing Leading Economic Index as it is unable to predict the magnitude of change in the economy. A study done by Yap [35] shows that turning point detection is not impressive for troughs and in addition to that, lead times are variable.

If stock market index is replaced by equity style index, will the Leading Economic Index become more sensitive to the change in business cycle? Henceforth, this paper intends to investigate the role played by equity style index in transmitting information, and justify on economic grounds that equity style index has its role to play in the process of information flow. Thus, further research in the future can be done to identify steps that could enhance the informational efficiency among these indices.

The rest of this paper is arranged as follows: Section one discusses the prior studies on leading, coincident economic indicators and their relevance with business cycle. This is followed by a number of studies that utilize growth value style index in recent years. Section two discusses data and methodology used. Section three reports the findings, and final section concludes the study.

1. Literature Review

The initial study related to forecasting with statistical indicators was undertaken by Burns and Mitchell and their colleagues at the National Bureau of Economic Research in 1937 as part of research program on business cycles A list of variables that were used as leading and coincident economic indicators was first complied by Mitchell and Burns in 1938, followed by the second and third lists which were compiled by Moore in 1950 and 1960 [9].

The indicators developed by them have been useful in constructing leading and coincident indexes that are used for summarizing and forecasting macroeconomic activity. In other study, Yeats [36] reviews historical performance of the Federal Reserve Board Sensitive Price Index. He finds that the SPI performs well as

an indicator for business conditions. Stekler et al. [33] examines the two aspects of the forecasting record of the index of 12 Leading Series. Their results indicate that ILS is a better indicator than a quantitative predictor.

Stock and Watson [34] revise those earlier indices using the tools of modern time series econometrics. As a result, they have created three experimental monthly indexes: an index of coincident economic indicators, an index of leading economic indicators and a Recession Index. They report that their experimental CEI tracks the coincident index produced by the Department of Commerce (DOC), although the methodology of producing these indexes differ. They relook into the definition of coincident indicators of which was defined as the "reference cycle" by Burns and Mitchell [5, pp. 46] as a broad-based swings in economic activity. The swings in the GNP is defined as the reference cycle.

They conclude that it is more appropriate to state that the reference cycle reflects co-movements of a broad range of macroeconomic aggregates such as output, employment and sales. Hence, they define the CEI as an estimate of the value of a single unobserved variable, C_t as "the state of the economy". They use "dynamic factor" model for the coincident variables to measure the co-movements across aggregate several time series. On the other hand, they propose a new LEI is the estimate of the growth of the unobserved factor over the six months, using a set of leading variables. They are more interested in the relative growth rather than the absolute level of economy activity.

Diebold el al. [11] evaluate the ability of the composite index of leading indicators to predict business cycle turning points. They use formal probability assessment scoring rules to turning points generated from the leading index via a Bayesian sequential probability recursion. Layton et al. [26] develop indicators that are combined to make a composite coincident index of aggregate economy activity in the service sector. They also construct a composite leading index and, they find that the index is able to give advance warnings of major swings in the growth of the service sector.

In another study, Diebold et al. [12] examine the ability of the composite index of leading economic indicators to predict future movements in aggregate economic activity. They perform real-time analysis by using partially revised data for the leading index along with recursive out-of-sample forecasts. They find substantial deterioration of forecasting performance in the real time framework. Filardo [17] examines the differences in expansionary and contractionary phases of business cycle. He finds that many of the economic variables that determine the time-varying probabilities help to predict turning points.

Hamilton et al. [21] find that the composite leading index is useful for forecasting gross national product, both in sample and in out-of-sample real-time exercise. They find that better forecasts are provided by a simple linear relation between current GNP growth and the growth rate of the CLI during the previous quarter along with an error-correction term. Kim et al. [23] study the business cycle turning points by creating a new coincident index and testing the duration dependence based on a dynamic factor model with regime switching. They find the new index was useful in practice and both the features of the business cycle are relevant. The two defining characteristics of business cycle are (i) co-movement among economic variables through the cycle and (ii) non-linearity in the evolution of the business cycle, that is, regime switching at the turning points of the business cycle.

Daniel [8] examines the episodes of banking system distress and crisis in a large sample of countries to identify which macroeconomic and financial variables can be used as leading indicators. Birchenhall et al. [3] use logistic classification methods for identifying and prediction of postwar U.S. business cycle expansion and contraction regimes as defined by NBER reference turning-point dates.

Forni et al. [18] develop a methodology for the construction of coincident and leading indicators for Euro Area. They find that the coincident indicator is well forecasted by the average leading variables. Camacho et al. [6] propose an optimal filter to transform Conference Board Composite Leading Index into recession probabilities the US economy. They analyze the accuracy of in anticipating US output growth. They confirm the usefulness of CLI, even in real-time analysis.

On the other hand, there are some literatures which look at the causality relationship between stock market indicators and GDP. These studies have established the causality relationship between stock market indices and Growth of

Gross Domestic Product (GDP). It is found that movement stock market index precedes the movement of GDP ([7], [22]). Since real GDP is often used as reference cycle, these studies established stock market index is a leading economic indicator. Even during East Asia Financial Crisis in 1997 and 98, Broome and Morley [4] found that domestic stock prices in Hong Kong and US are significant leading indicators during the period. In summary, there has been no study done to examine the role of equity style index as a leading economic indicator.

1.1 Theoretical Framework

As mentioned in above, growth style and value style indices are used as the equity style indices in this study. Since equity style index has economic content, it is hypothesized that:

Hypothesis 1: *there will be a causal relationship between equity style index and leading economic index if equity style is a leading indicator.*

Hypothesis 2: *there will be a causal relationship between equity style index and stock market index if equity style is a leading indicator.*

Hypothesis 3: *there will be a causal relationship between equity style index and broad market index.*

As discussed in above, equity style index is a refinement from stock market index. Hence, the information content from the movement of growth stocks and value stocks should precipitate the movement of other indicators. Hypothesis 1 is a strong hypothesis. If equity style is a leading indicator, it should Granger cause existing leading economic index theoretically.

In similar argument, hypothesis 2 is set to state that equity style will Granger cause stock market index like Industrial sector. If equity style is a leading indicator, it should possess information earlier that other indicators. Hence, equity style should Granger cause industrial sectoral index.

Hypothesis 3 is set to confirm whether there is a relationship between equity style index and broad market index. It is expected that both will have feedback effect between them. Theoretically, most of growth stocks are big capitalization stocks similar to the component stocks in broad market index like Kuala Lumpur Composite Index (KLCI).

2. Data and Methodology

This study uses three types of data. The first type of data used is Malaysian economic indicators which consist of leading economic index **("LEI")**, coincident economic index **("CEI")** published by the Department of Statistics, Malaysia on month-to-month basis.

The second type of data used is Morgan Stanley Capital International (MSCI) equity style indices which consist of two equity style indices. They are MSCI Malaysia Value Style Index **("Value")** and MSCI Malaysia Growth Style Index **("Growth")**.

The third type of data used is stock market indices which consist of two indices. They are Kuala Lumpur Composite Index ("**KLCI")** and Bursa Malaysia Industrial Index **("Industrial")** sourced from Kuala Lumpur Stock Exchange. Monthly data from May 1997 to July 2007 are used for this study.

2.1 Unit Root Test

Unit root rest will be conducted to ensure the stationarity of variables being tested. For this study, Phillips-Perron [29] unit root test is more preferred for small sample study as per to Hallam and Zanoli [20] and Obben [28].

The PP test equation is

$$\Delta y_t = \mu + \beta t + \delta y_{t-1} + \varepsilon_t \quad (1)$$

The hypothesis to be tested is

H_0: $\delta = 0$ versus H_1: $\delta < 0$.

Non parametric corrections are made to the test statistic to account for serially correlated and heteroscedastic error term. The critical values are given by Mackinnon [27]. If H_0 is rejected, the series y_t is said to be stationary.

In order to confirm the result of the unit root test, stationarity tests have also been carried out. In this instance, KPSS test by Kwaitowski, Phillips, Schmidt and Shin [24] is used. Under the null hypothesis, the series y_t is assumed to be stationary. On the contrary, under the alternative hypothesis, y_t is non-stationary. So that by default under the null the series will appear stationary.

H_0: $y_t \sim I(0)$
H_1: $y_t \sim I(1)$

2.2 Vector Autoregression (VAR)

Vector autoregression model VAR (*p*) is an extension of the univariate autoregression model to model multivariate time series model. In the case where the *k* variables are not co-integrated, a VAR model with lag *p* is defined as

$$y_t = c + A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p} + \varepsilon_t \quad (2)$$

where y_t defined as ($y_{1,t}$, $y_{2,t}$, $y_{k,t}$) of $k \times 1$ vector, each c is a $k \times 1$ vector of constant (intercept), each A_1 is a $k \times k$ coefficient matrix and ε_i is $k \times 1$ error terms vector.

The lag length for the VAR(p) model may be determined by using model selection. A standard practice Akaike Information Criterion (AIC)

$$AIC = n\sum \hat{u}_t^2 + 2(k+1) \quad (3)$$

where u_t denoted as residuals is applied in selecting lag length.

2.3 Granger's Causality Test

Next, causality tests are used to assess the information content of leading indicators. Granger's [19] test used within a bivariate context, states that if a variable *x* Granger causes the variable y, the mean square error (MSE) of a forecast y based on the past values of both variables is lower than that of a forecast that uses only past values of y. Equation (4) shows the autoregression where the Granger causality test is carried out. However, differencing is only restricted to variables with unit roots.

$$\Delta y_t = \alpha + \sum_{i=1}^{p} \beta_i \, \Delta y_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta x_{t-i} + \varepsilon_t \quad (4)$$

and testing the joint hypothesis

$$H_0 : \gamma_1 = \gamma_2 = ... = \gamma_p = 0.$$

H_1: At least one of the γ_i is not equal to zero.

If the asymptotic chi-square test rejects the H_0, then Granger causality from the leading indicator *x* to the coincident indicator *y* is established. A significant test statistic indicates that the leading indicator *x* has predictive value for forecasting movements in the chosen coincident indicator *y*, over the information contained in the past of *y*.

In Granger's causality test, the direction of causal effect between equity style indices and stock indices, equity style indices and economic indicators, stock indices and economic indicators is tested using restricted F test statistic as shown equation (5). Using optimal lag length, the parameter of the model is tested with null hypothesis that there is no Granger causality between two series. As proposed by Engle and Granger [13]:

$$F = \frac{(RSS_R - RSS_U)/p}{RSS_U/(n-2p-1)} \quad (5)$$

where RSS_R is the residual sum of squares of restricted model while the RSS_U is the residual sum of square of unrestricted model; n represents sample size and p is the number of restricted parameters.

2.4 Cross Correlation Analysis

Cross correlation is a standard method to estimate the degree to which two series are correlated. Consider both to be examined series x_t and y_t at time *t*, the cross correlation function:

$$r_{xy}(k) = \frac{c_{xy}(k)}{\sigma_{xx}\,\sigma_{yy}} \quad (6)$$

where c_{xy} is sample cross covariance of two series at lead k, σ_{xx} and σ_{yy} are the standard deviation of processes of x_t and y_t respectively.

3. Results

Table 2 presents the descriptive statistics of all the series. It can be observed between the two economic indicators, leading economic index is more volatile than coincident economic index as shown by the standard deviation of 21.06 versus 10.75. In addition, Industrial Index is more volatile than KLCI Index. Finally, between MSCI Malaysia Value Style Index and Growth Style Index, the former is more volatile than the latter.

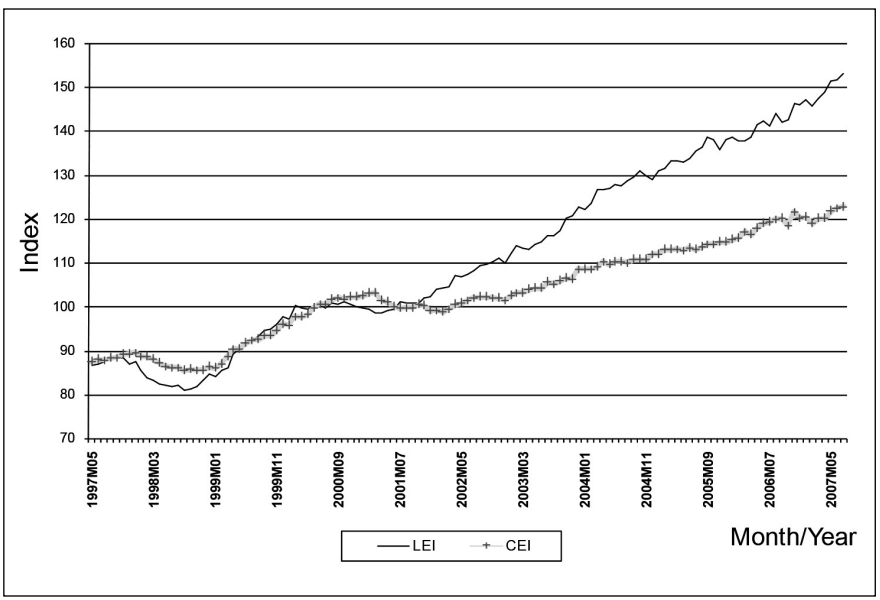
Figure 1 shows both LEI and CEI have upward trend for the period from May 1997 to July 2007. However, LEI is relatively steeper

Tab. 2: Descriptive statistics

	LEI	CEI	KLCI	INDUSTRIAL	GROWTH	VALUE
Mean	111.9146	103.0187	793.4977	1586.717	47.69187	106.3748
Median	107.2000	102.1000	779.2800	1450.980	46.50000	104.7000
Maximum	153.0000	122.7000	1373.710	2635.930	100.0000	200.7000
Minimum	80.90000	85.40000	302.9100	639.4400	22.20000	29.00000
Std. Dev.	21.06235	10.75063	197.0823	426.7843	13.17089	32.75369
Skewness	0.274197	0.009767	0.552798	0.314005	1.399041	0.395683
Kurtosis	1.808670	1.996161	3.953978	2.584559	6.152321	3.680999
Jarque-Bera	8.815018	5.166377	10.92864	2.905811	91.05272	5.586350
Probability	0.012185	0.075533	0.004235	0.233890	0.000000	0.061227
Sum	13765.50	12671.30	97600.22	195166.2	5866.100	13084.10
Sum Sq. Dev.	54121.93	14100.27	4738653.	22221672	21163.61	130882.2
Observations	123	123	123	123	123	123

Sources: Department of Statistics, MSCI and Bursa Malaysia [10], [2]

Fig. 1: Leading economic index (LEI) and coincident economic index (CEI)



Source: Department of Statistics, Malaysia [10]

Tab. 3: Trend in level and first difference

Variable	t-statistics		Variable	t-statistics
lnKLCI	2.90***		Δ lnKLCI	0.55
lnValue	3.31***		Δ lnValue	0.10
lnGrowth	2.41**		Δ lnGrowth	0.72
lnLead	3.58***		Δ lnLead	–0.28
lnCoincident	2.89***		Δ lnCoincident	–0.38
lnIndustrial	4.00***		Δ lnIndustrial	0.42

Source: own

The asterisks ***, ** and * denote statistical significance at 1%, 5% and 10% level respectively

than CEI. As observed, LEI depicts the level of economy activities with turning points at 1997:07 (the beginning of economy slow down), 1998:09 (the beginning of recovery), 2000:10 (the beginning of another slow down) and 2001:09 (the beginning of an expansion). It can be concluded that the turning points correspond to events like Asian financial crisis (1997:07), the imposition of capital control (1998:09), dot-com bubble (2000:10). Overall, it can be seen that CEI tracks LEI at different pace and degrees of amplitude. It can be concluded that LEI leads CEI based on the composite of leading macroeconomic variables used by the Department of Statistics.

We conducted the procedure developed by Stock and Watson [34] to check on the presence of deterministic trend in the series both in level and its first-difference in table 3. The t-statistics on the coefficient of the time trend indicate that time trend is present in all the series in level. However, the series are detrended after first difference.

3.1 Unit Root Test Results

All series are transformed into natural logarithm before the unit root test is conducted. Phillips-Perron (PP) [29] tests for unit root are conducted on the logarithmic series of the respective variable of leading economic index (*lnLEI*), coincident economic index (*lnCEI*), Kuala Lumpur Composite Index (*lnKLCI*), Bursa Malaysia Industrial Index (*lnIndustrial*), MSCI Malaysia Value Style Index (*lnValue*) and MSCI Malaysia Growth Style Index (*lnGrowth*).

Since the preliminary test of trend in series indicated that all variables contain trend in level, we will proceed to test the unit root test with assumption of constant with trend in level. As shown in table 4, PP test has shown that lnKLCI, lnValue, lnGrowth and lnIndustrial are stationary at level. As for lnLEI and lnCEI, they are stationary after taking first difference. According to Hallam and Zanoli [20] and Obben [28], the result from PP test is more preferred for small sample study as the test is more powerful.

For KPSS test, lnKLCI, lnValue, lnGrowth and lnIndustrial do not reject H_0. Hence, they are stationary. Finally, lnLEI and lnCEI are stationary after taking first difference. Therefore, we concluded that lnKLCI, lnIndustrial, lnValue and lnGrowth are I(0) while lnLEI and lnCEI are I(1) processes. Subsequently, we take first difference for lnLEI and lnCEI in VAR model.

3.2 Granger Causality Results

We proceed to form vector autoregression model (VAR) and conduct Granger's Causality test for first model without equity style indices. Lag length criteria is checked and the model is at its optimal lag length one. However, as shown in table 5, none of the series shows any causality with significant result.

Next, a second model is formed by taking into account both value style and growth style indices. Based on the VAR model in table 6, looking at the last column, the asymptotic Granger Chi-squared statistics are statistically significant at one per cent for growth style index to granger cause LEI, KLCI, industrial index and value style index. The results also showed that another equity style, MSCI value style index (Value) has some significant influence on lnKLCI and lnGrowth, however, it is not as influential as growth style index.

The relationship from table 6 is summarized in figure 2. Firstly, there is unidirectional

Tab. 4: Unit root and stationary test results

Variable	Phillips-Perron		Kwiatkowski-Phillips-Schmidt-Shin	
	Level	First difference	Level	First difference
	Trend	No trend	Trend	No trend
lnKLCI	–3.44 (6)**		0.10(8)	
lnValue	–3.45 (9)**		0.04(8)	
lnGrowth	–3.56 (6)**		0.14(11)	
lnLEI	–2.91 (6)	11.06(6)***	0.16(3)**	0.15(6)
lnCEI	–2.27 (6)	11.97(6)***	0.18(2)**	0.06(6)
lnIndustrial	–3.96 (8)**		0.12(8)	

Source: own

The asterisks *** and ** denote statistical significance at 1% and 5% level respectively.
Figures in parentheses are the optimal lag length chosen.
Critical values are based on Kwiatkowski,Phillips,Schmidt and Shin [24].
For Phillips-Perron test, critical values are based on Mackinnon [27].

Tab. 5: Granger causality test results based on VAR for four series

Dependent Variables	Variables			
	Δ lnLEI	**Δ lnCEI**	**lnKLCI**	**lnIndustrial**
Δ lnLEI		0.753179 (0.385)	0.024698 (0.875)	0.00092 (0.975)
Δ lnCEI	0.75106 (0.386)		2.205876 (0.137)	1.05520 (0.304)
lnKLCI	0.01126 (0.915)	0.28708 (0.592)		0.79283 (0.373)
lnIndustrial	0.23210 (0.630)	0.13766 (0.710)	0.42272 (0.515)	

Source: own

Note: *, ** and *** denote statistical significance at 1%, 5% and 10% level respectively.
All estimates are asymptotic Granger Chi-squared statistics. Values in parentheses are p-values.

causality from growth style index to LEI. This result strongly supports hypothesis 1 at one percent level that growth style index precipitates the movement of LEI. There is information flow from growth style index to LEI.

Secondly, there is unidirectional flow from as growth style to Industrial sectoral Index as shown in figure 2. This result lends strong support to hypothesis 2 that growth style index transmits information to the Industrial sector index at 1 percent significance level based on table 6.

Thirdly, there is bidirectional relationship between growth style index and broad market KLCI. This result supports hypothesis 3 and shows that there is feedback effect between them. Lastly, there is bidirectional flow between growth style and value style. It should shows there is feedback effect between the two equity style indices.

These empirical results underscore that growth style index economic information that precedes leading economic index and Industrial index. In the context of Granger causality, we

Tab. 6: Granger causality test results based on VAR for six series

Dependent Variables	Variables					
	Δ lnLEI	Δ lnCEI	lnKLCI	lnIn-dustrial	lnValue	lnGrowth
Δ lnLEI		0.6733 (0.411)	5.3055 (0.021)**	0.1937 (0.659)	2.1431 (0.143)	6.9721 (0.008)***
Δ lnCEI	0.2285 (0.632)		2.0411 (0.153)	1.0169 (0.313)	0.5246 (0.468)	1.4344 (0.231)
lnKLCI	1.2049 (0.272)	0.5046 (0.477)		0.0263 (0.871)	4.0266 (0.044)**	13.296 (0.000)***
lnIndustrial	0.5931 (0.441)	0.2799 (0.596)	5.4337 (0.019)**		1.4744 (0.225)	9.6592 (0.002)***
lnValue	1.5581 (0.211)	0.5709 (0.449)	8.5005 (0.003)***	0.2154 (0.643)		14.075 (0.000)***
lnGrowth	0.7319 (0.392)	0.5453 (0.460)	7.7909 (0.005)***	0.1424 (0.706)	3.0108 (0.083)*	

Source: own

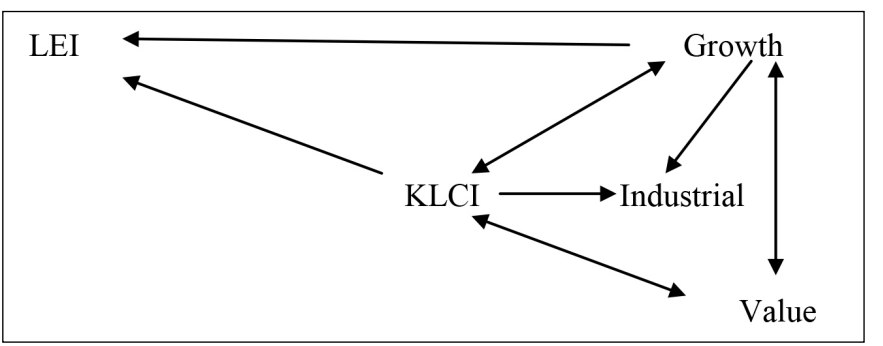
Note: *, ** and *** denote statistical significance at 1%, 5% and 10% level respectively.
All estimates are asymptotic Granger Chi-squared statistics. Values in parentheses are p-values.

can state past values of growth style can be used to predict the current value of leading economic index and industrial index. This lends support that growth style Index should be included as a component of leading economic index instead of Industrial Index. This new evidence should be examined by policy makers who involved in the design of leading economic index and earning warning system of financial crisis.

3.3 Cross-Correlation Results

To increase robustness to our result, we further examine the cross-correlation between Industrial Index and LEI. As shown in table 7, the variance of the cross-correlation coefficient under the null hypothesis of zero correlation is approximate to 1/*n* where *n* is the length of the series. On the assumption that the coefficients are also asymptotically normal, the approximate critical values at the 5 per

Fig. 2: Short-run causal relationship



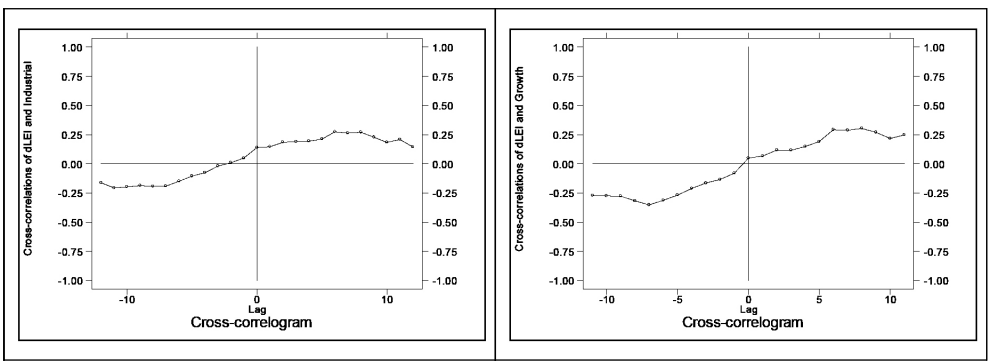
Tab. 7: **Cross-correlation between LEI and Industrial Index (left – 7a)**
Cross-correlation between LEI and Growth Style Index (right – 7b)

DLNLEAD,LNIND(-i)	DLNLEAD,LNIND(+i)	i	lag	lead
		0	0.1402	0.1402
		1	0.0485	0.1463
		2	0.0100	0.1828
		3	-0.0197	0.1906
		4	-0.0772	0.1934
		5	-0.1061	0.2126
		6	-0.1485	0.2740
		7	-0.1906	0.2637
		8	-0.1934	0.2708
		9	-0.1866	0.2282
		10	-0.1977	0.1829
		11	-0.2059	0.2086
		12	-0.1615	0.1449
		13	-0.1386	0.1665
		14	-0.0978	0.1321
		15	-0.0930	0.0772
		16	-0.0770	0.0667
		17	-0.0324	0.0446
		18	-0.0303	0.0623
		19	-0.0004	0.0408
		20	0.0261	0.0214

DLNLEAD,LNGRO(-i)	DLNLEAD,LNGRO(+i)	i	lag	lead
		0	0.0501	0.0501
		1	-0.0820	0.0661
		2	-0.1344	0.1178
		3	-0.1656	0.1165
		4	-0.2120	0.1493
		5	-0.2685	0.1902
		6	-0.3115	0.2918
		7	-0.3523	0.2876
		8	-0.3181	0.3034
		9	-0.2769	0.2700
		10	-0.2740	0.2173
		11	-0.2714	0.2480
		12	-0.1930	0.1697
		13	-0.1583	0.1878
		14	-0.0935	0.1230
		15	-0.0734	0.0503
		16	-0.0292	0.0312
		17	0.0251	-0.0129

Source: own

Fig. 3: **Cross-correlogram between LEI and Industrial Index (left – 3a);**
Cross-correlation between LEI and Growth Style Index (right – 3b)



Source: own

cent level are ±2/√n. As observed, Industrial Index is leading LEI from t+2 to t+11 with the strongest lead at t+6 with positive correlation of 0.2740. Based on Based on the calculation of ±2/√n, the critical value is 0.18107. In contrast, for cross-correlation between growth style index and LEI in table 7b, Growth style index is leading LEI from t+5 to t+13, with the strongest lead at t+8 with positive correlation of 0.3034. Hence, it can be concluded that growth style index is a better candidate as predictor for LEI.

Taking a closer look at the figure 3(a) on the left, the cross-correlation between LEI and Industrial Index is relatively positive at zero lag. The diagram also shows the relationship is non-proportional in nature. For figure 3(b) on the right, it can be observed that LEI and growth style is not correlated at zero lag, and the correlation between input variable at time t and output variable at t+i is more proportional as time increases. This reaffirms the earlier conclusion as growth style index is better in terms of proportionality.

Conclusion

This study has managed to unravel the missing link among there groups of indices. It shows that equity style index like growth style index is more sensitive to new information in the capital market as compared to stock market index like Bursa Malaysia Industrial Index. The implication of this study can be manifold. Firstly, equity style index is more sensitive, hence a better candidate to be a component of leading economic index that helps to detect turning point in business cycle.

Secondly, this study adds another stylized fact that equity style index has economic content and the ability to transmit information far from what is recorded in literature. This underscores the third point that equity style index can be used to construct Early Warning System of financial crisis. Last but not least, equity style index are more suitable to be used in mutual fund classification of which has been a practice in advanced financial markets as compared to emerging markets. This type is classification is more meaningful as equity style index by itself has economic content to begin with. It is right time for the relevant authority to review the components of the economic indices with respect to their efficacy in transmitting information.

The authors would like to express their appreciation for useful comments by participants in presentation at the 19th Annual Conference of PBFEAM held in Taiwan, July 2011. The authors would also like to record their appreciation for funding under FRGS Grant under Ministry of Education and University of Malaya. Finally the authors would like to thank Dr. Sieh Lee Mei Ling, Head of The Service Research and Innovation Centre (ServRI), Faculty of Business & Accountancy, University of Malaya for her kind support for this research.

References

[1] AHMAD, N. Malaysia Economic Indicators-Leading, Coincident and Lagging Indices. *OECD/ESCAP Workshop on Composite Leading Indicators and Business Tendency Surveys, Bangkok, 24 – 26 February 2003* [online]. [cit. 2012-03-01]. Available from: http://www.unescap.org/stat/meet/cli_bts/cli_bts.asp.

[2] BANK NEGARA MALAYSIA. *Monthly statistical bulletin*. Kuala Lumpur: Central Bank Publication, 2000-2012.

[3] BIRCHENHALL, C.R., et al. Predicting U.S. business-cycle regimes. *Journal of Business & Economic Statistics*. 1999, Vol. 17, Iss. 3, pp. 313-323. ISSN 1537-2707. DOI: 10.1080/07350015.1999.10524820.

[4] BROOME, S., MORLEY, B. Stock prices as a leading indicator of the East Asian financial crisis. *Journal of Asian Economics*. 2004, Vol. 15, Iss. 1, pp. 189-197. ISSN 1049-0078. DOI: 10.1016/j.asieco.2003.12.008.

[5] BURNS, A.F., MITCHELL, W.C. *Measuring business cycles*. New York: National Bureau of Economic Research, 1946.

[6] CAMACHO, M., PEREZ-QUIROS, G. That is what the Leading Indicators Lead. *Journal of Applied Econometrics*. 2002, Vol. 17, Iss. 1, pp. 61-80. ISSN 1099-1255. DOI: 10.1002/jae.641.

[7] COMINCIOLI, B. The stock market as a leading indicator: an application of Granger causality. *The Park Place Economist*. 1996, Vol. 4, Iss. 1, pp. 31-40. Available also from: http://digitalcommons.iwu.edu/parkplace/vol4/iss1/13.

[8] DANEIL, C.H., PAZARBASIOGLU, C. Determinants and leading indicators of banking crisis: further evidence. *IMF Staff Paper*. 1999, Vol. 46, Iss. 3, pp. 257-258. ISSN 1020-7635.

[9] DALY, D.J. Forecasting with statistical indicators. In: HICKMAN, B.G. (Ed.). *Econometric models of cyclical behavior*. Vol.1 and 2. NBER Book Series Studies in Income and Wealth, 1972. pp. 1159-1208.

[10] DEPARTMENT OF STATISTICS MALAYSIA. *Malaysia economic indicators: leading, coincident & lagging Indices*. Kuala Lumpur: Government Printers, 2000-2012.

[11] DIEBOLD, F.X., RUDEBUSCH, G.D. Scoring the leading indicators. *Journal of Business*. 1989, Vol. 62, Iss. 3, pp. 603-610. ISSN 0148-2963.

[12] DIEBOLD, F.X., RUDEBUSCH, G.D. Forecasting output with the composite leading index: a real-time analysis. *Journal of the American Statistical Association*. 1991, Vol. 86, Iss. 415, pp. 603-610. ISSN 1537-274X. DOI: 10.1080/01621459.1991.10475085.

[13] ENGLE, R.F., GRANGER, C.W.J. Co-integration and error correction: representation, estimation and testing. *Econometrica*. 1987, Vol. 55, Iss. 2, pp. 251-276. ISSN 1468-0262. DOI: 10.2307/1913236.

[14] FAMA, E.F., FRENCH, K.R. The cross-section of expected stock returns. *Journal of Finance*. 1992, Vol. 47, Iss. 2, pp. 427-

465. ISSN 1540-6261. DOI: 10.1111/j.1540-6261.1992.tb04398.x.
[15] FAMA, E.F., FRENCH, K.R. Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*. 1993, Vol. 33, Iss. 1, pp. 3-56. ISSN 0304-405X. DOI: http://dx.doi.org/10.1016/0304-405X(93)90023-5.
[16] FAMA, E.F., FRENCH, K.R. Multifactor explanations of asset pricing anomalies. *Journal of Finance*. 1996, Vol. 51, Iss. 1, pp. 55-84. ISSN 1540-6261. DOI: 10.1111/j.1540-6261.1996.tb05202.x.
[17] FILARDO, A.J. Business-cycle phases and their transitional dynamics. *Journal of Business and Economic Statistics*. 1994, Vol. 12, Iss. 3, pp. 299-308. ISSN 1537-2707. DOI: 10.2307/1392086.
[18] FORNI, M., et al. Coincident and leading indicators for the euro. *The Economic Journal*. 2001, Vol. 111, Iss. 471, pp. C62-C85. ISSN 1468-0297. DOI: 10.1111/1468-0297.00620.
[19] GRANGER, C.W.J. Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*. 1969, Vol. 37, Iss. 3, pp. 424-438. ISSN 1468-0262. DOI: 10.2307/1912791.
[20] HALLAM, D., ZANOLI, R. Error-correction models and agricultural supply response. *European Review of Agricultural Economics*. 1993, Vol. 20, Iss. 2, pp. 155-166. ISSN 1467-9353. DOI: 10.1093/erae/20.2.151.
[21] HAMILTON, J.D., PEREZ-QUIROS, G. What do the leading indicators lead? *Journal of Business*. 1996, Vol. 69, Iss. 1, pp. 27-49. ISSN 0148-2963. DOI: http://doi.org/10.3886/ICPSR01127.v1.
[22] HUH, H.S. GDP growth and the composite leading index: a nonlinear causality analysis for eleven countries. *Economics Letters*. 2002, Vol. 77, Iss. 1, pp. 93-99. ISSN 0165-1765. DOI: 10.1016/S0165-1765(02)00109-X.
[23] KIM, C.J., NELSON, C.R. Business cycle turning points, a new coincident index, and tests of duration dependence based on a dynamic factor model with regime switching. *Review of Economics and Statistics*. 1998, Vol. 80, Iss. 2, pp. 188-201. ISSN 1530-9142. DOI: 10.1162/003465398557447.
[24] KWIATKOWSKI, D., PHILIPS, P.C.B., SCHMIDT, P., SHIN, Y. Testing the null hypothesis of stationarity against the alternative of a unit root. *Journal of Econometrics*. 1992, Vol. 54, Iss. 1-3, pp. 159-178. ISSN 0304-4076. DOI: 10.1016/0304-4076(92)90104-Y.
[25] LAKONISHOK, J., SHLEIFER, A., VISHNY, R. Contrarian investment, extrapolation and risk. *Journal of Finance*. 1994, Vol. 49, Iss. 5, pp. 1541-1578. ISSN 1540-6261. DOI: 10.1111/j.1540-6261.1994.tb04772.x.
[26] LAYTON, A.P., MOORE, G.H. Leading indicators for the service sector. *Journal of Business & Economic Statistics*. 1989, Vol. 7, Iss. 3, pp. 379-386. ISSN 1537-2707. DOI: 10.2307/1391534.
[27] MACKINNON, J.G. Numerical distribution functions for unit root and cointegration tests. *Journal of Applied Econometrics*. 1996, Vol. 11, Iss. 6, pp. 601-618. ISSN 1099-1255. DOI: 10.1002/(SICI)1099-1255(199611)11:6<601::AID-JAE417>3.0.CO;2-T.
[28] OBBEN, J. The demand for money in Brunei. *Asian Economic Journal*. 1998, Vol. 12, Iss. 2, pp. 109-121. ISSN 1467-8381. DOI: 10.1111/1467-8381.00055.
[29] PHILIPS, P.C.B., PERRON, P. Testing for unit roots in time series regression. *Biometrika*. 1988, Vol. 75, Iss. 2, pp. 335-346. ISSN 1464-3510. DOI: 10.1093/biomet/75.2.335.
[30] SHARPE, W.F. Asset allocation: management style and performance measurement. *Journal Portfolio Management*. 1992, Vol. 18, Iss. 2, pp. 7-19. ISSN 0095-4918. DOI: 10.3905/jpm.1992.409394.
[31] SHARPE, W.F., CAPAUL, C., ROWLEY, I. International value and growth stock returns. *Financial Analyst Journal*. 1993, Vol. 49, Iss. 1, pp. 27-36. ISSN 0015-198X. DOI: http://dx.doi.org/10.2469/faj.v49.n1.27.
[32] SINQUEFIELD, R. Where are the gains from international diversification. *Financial Analyst Journal*. 1996, Vol. 52, Iss. 1, pp. 8-14. ISSN 0015-198X. DOI: http://dx.doi.org/10.2469/faj.v52.n1.1961.
[33] STEKLER, H.O. Forecasting with econometric models: an evaluation. *Econometrica*. 1968, Vol. 36, Iss. 3-4, pp. 437-463. ISSN 1468-0262. DOI: 10.2307/1909516.
[34] STOCK, J.H., WATSON, M.W. New indexes of coincident and leading economic indicators. *NBER Macroeconomics Annual*. 1989, Vol. 4, pp. 351-409. ISSN 0889-3365.
[35] YAP, M.M.C. Assessing Malaysia's business cycle indicators. *Monash University Discussion Paper 04/09*. Monash: Monash University Sunway Campus, Business School, Economics Department, 2009. pp. 1-24. ISSN 1441-5459.

[36] YEATS, A.J. An evaluation of the predictive ability of the FRB sensitive price index. *Journal of the American Statistical Association*. 1973, Vol. 68, Iss. 344, pp. 782-787. ISSN 0162-1459. DOI: 10.1080/01621459.1973.10481424.

Dr. Wee-Yeap LAU, PhD
National University of Singapore
Risk Management Institute
University Malaya
Faculty of Economics and Administration
Department of Applied Statistics
wylau@um.edu.my
lau_wy@nus.edu.sg

Dr. Chin LEE, PhD, MSc, BEc
Universiti Putra Malaysia
Faculty Economics and Management
Department of Economics
leechin@econ.upm.edu.my

Abstract

TESTING THE EFFICACY OF INFORMATION TRANSMISSION: IS EQUITY STYLE INDEX BETTER THAN STOCK MARKET INDEX?

Wee-Yeap Lau, Chin Lee

This paper examines the ability of equity style to predict future movement of composite leading economic index in a multivariate Granger causality framework. By comparing the efficacy of information transmission between equity style index and Bursa Malaysia Industrial Index, our results show that there is unidirectional causality from growth style to leading economic index. Second, there is also unidirectional flow from growth style to Bursa Malaysia Industrial Index. Third, there is a bidirectional relationship between growth style and KLCI broad market index. Finally, there is bidirectional causality between both growth style and value style. Further analysis from cross-correlation function reveals that growth style index is better than Bursa Malaysia Industrial Index. The former provides accurate and stronger cross-correlation with leading economic index. From these empirical evidences, it can be concluded that growth style index is a leading indicator which has more economic content than stock market index. It is better than stock market index in its efficacy of information transmission. The study brings to the awareness to policy makers and practitioners of the usefulness of equity style in constructing future leading economic index and early warning system of financial crisis.

Key Words: *Equity style index, composite leading index, leading economic indicators, business cycle, Granger causality.*

JEL Classification: *C58, E32, G17.*

DOI: *10.15240/tul/001/2015-3-001*